



## Debridement arthroplasty for osteoarthritis of the elbow (Outerbridge-Kashiwagi procedure)

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The Outerbridge-Kashiwagi (O-K) procedure has been described to treat mild to moderate osteoarthritis of the elbow. We treated a consecutive series of 15 patients (16 elbows) with the O-K procedure. All patients were reviewed after a mean follow-up of twenty months (range 3-64 months). The purpose of this study was to evaluate the results of the O-K procedure. Assessment included evaluation of elbow pain, range of motion and the Mayo elbow Performance Index (MPI).

The mean arc of motion improved from 94° (range, 65°-120°) preoperatively to 114° (range 93°-128°) at the time of follow-up ( $p < 0.01$ ). At the latest follow-up evaluation the total MPI improved from 63 (range, 50-75) to 88 (range, 45-100) ( $p < 0.01$ ), eight elbows (50%) had no pain, seven (43.8%) mild pain and one (6.2%) moderate pain. The result was excellent for 8 elbows (50%), good for 6 (37.5%), fair for one (6.2%) and poor for one (6.2%). Patients' satisfaction showed that thirteen (86.6%) were much better or better and two (13.3%) were not improved compared with the preoperative situation.

Many operative procedures have been described: interposition arthroplasty using fascia or an artificial membrane (16), debridement arthroplasty (17), the O-K procedure (4), arthroscopic debridement (6, 12) and total elbow replacement.

The Outerbridge-Kashiwagi (O-K) procedure was described by Kashiwagi in 1978 according to the idea and suggestion of R. Outerbridge (3, 4, 6, 12); it has been used to treat mild to moderate osteoarthritis of the elbow. Minami (7) reported that osteoarthritic changes of the elbow joint start with formation of osteophytes on the coronoid and in the olecranon fossa. The size of these osteophytes seemed closely related to the degree of flexion and extension loss. These features undoubtedly contribute to impingement and reduction of elbow movement. Kashiwagi developed the surgical procedure based on this observation: open debridement of the ulnohumeral joint through a triceps splitting approach with resection of olecranon osteophytes, fenestration of the olecranon fossa

### INTRODUCTION

Degenerative osteoarthritis of the elbow is uncommon; it usually affects middle-aged men with an occupation or activity which involves the repetitive and/or stressful use of their (dominant) arm. It causes severe disabling symptoms such as pain, locking and stiffness. Management options have long been limited to conservative treatment.

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Table I. — Preoperative status of the patients

	N
Symptoms	
locking	10
cubital tunnel syndrome	6
dominant side affected	13
Previous operations	6
medial epicondylectomy	1
lateral arthrotomy	2
arthroscopy	2
ulnar nerve neurolysis	1
Radiographic degree of OA	
mild	4
moderate	10
severe	2
Osteoarthritis	
primary	7
secondary	9
Operative procedures	
ulnar nerve neurolysis	1
lateral arthrotomy + radial head excision	4 (3)
anterior loose body removal	12
posterior loose body removal	8

and resection of coronoid osteophytes. Only a few series have been reported up till now (1, 8, 10).

## MATERIALS AND METHODS

Between January 1998 and January 2003 15 consecutive patients (16 elbows) underwent the O-K procedure for mild to moderate osteoarthritis of the elbow joint. All were retrospectively assessed by an independent observer (BV). Preoperative data and operative details were taken from the case notes (table I). Demographic data are given in table II. Seven elbows had primary osteoarthritis, nine secondary osteoarthritis (2 posttraumatic, 2 with congenital synostosis of the proximal radius and ulna, one after avascular necrosis of the capitellum and four had synovial chondromatosis).

Six patients previously underwent surgery (table I). The indications for surgery were pain and limitation of motion not responding to conservative treatment and radiographic evidence of spur formation and bony ridges, or loose bodies in the joint.

The radiological degree of osteoarthritis (5) was divided into 4 grades : none, mild (including patients with only loose bodies) (N = 4), moderate (N = 10) and severe (N = 2) (13) (fig 3a).

Table II. — Demographic data

	Data
Mean age (range)	50 y (31 - 66 y)
Sex distribution (M/F)	13/2
Employment	
– manual worker	5
– office worker	7
– unemployed	3

The patients' satisfaction was assessed by asking them how they felt at the time of follow-up compared with how they felt before the operation, and was graded as much better, better, unchanged, or worse.

All patients were evaluated preoperatively and at the time of follow-up with the Mayo elbow Performance Index (MPI) to assess pain, motion, stability and function. A score of 90 to 100 was defined as an excellent result ; 75 to 89 points as a good result ; 60 to 74 as a fair result and < 60 points as a poor result (9). The follow-up ranged from 3 to 64 months, with a mean follow-up of 20 months.

## Surgical procedure

The O-K procedure was performed with the patient in the lateral position, the upper arm horizontal and the elbow in 90° flexion (15). A tourniquet was used. Through a midline posterior incision extending proximally for 6 cm from the tip of the olecranon with a triceps split, the posterior compartment of the elbow was debrided using an osteotome to remove osteophytes around the olecranon fossa and from the tip of the olecranon ; loose bodies were removed. Fenestration of the olecranon fossa was performed with a drill giving access to the anterior compartment of the elbow. Any loose bodies in the anterior compartment were removed (fig 1). Osteophytes on the coronoid process were removed with a rongeur. We found loose bodies in the anterior compartment in twelve elbows and in the posterior compartment in eight. One patient also underwent neurolysis of the ulnar nerve and medial epicondylectomy. In four patients we combined the procedure with a lateral arthrotomy for a release of the anterior capsule, in three of them we performed a radial head excision (fig 3b).



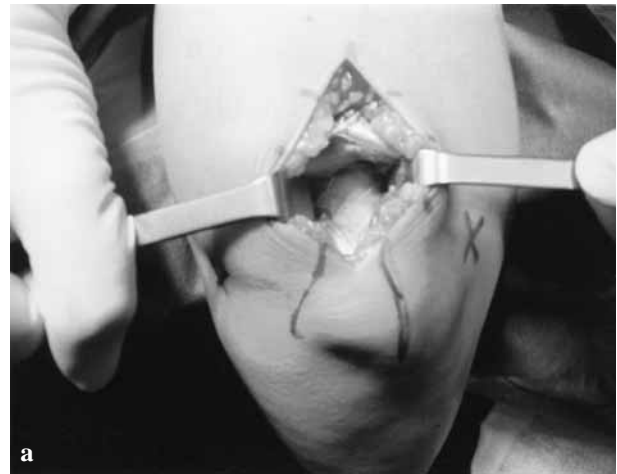
*Fig. 1.* — Landmarks and incision

### Statistical analysis

The Wilcoxon test (paired) was used to compare the preoperative values with those at follow-up for the arc of motion and the MPI. Significance was set at  $p < 0.05$ .

### RESULTS

At follow-up the mean flexion-extension arc improved from  $94^\circ$  (range  $65^\circ - 120^\circ$ ) preoperatively to  $114^\circ$  (range  $93^\circ - 128^\circ$ ) postoperatively ( $p < 0.01$ ). The main flexion increased from  $120^\circ$  (range  $105^\circ - 140^\circ$ ) preoperatively to  $129^\circ$  (range  $115^\circ - 145^\circ$ ), the average loss of extension decreased from  $25^\circ$  (range  $5^\circ - 47^\circ$ ) to  $15^\circ$  (range  $0^\circ - 30^\circ$ ). The mean MPI increased from 63 (range 45 - 75) preoperatively to 88 (range 45 - 100) ( $p < 0.01$ ). Eight elbows (50%) had no pain, seven (43.8%) mild pain and one (6.2%) moderate pain. The result was excellent for eight elbows (50%), good for six (37.5%), fair for one (6.2%) and poor for one (6.2%). In conclusion, fourteen elbows (87.5%) had a satisfactory objective result and two elbows (12.5%) had an unsatisfactory result. Subjectively, the patient's satisfaction showed that thirteen patients (86.7%) were much better or better, two (13.3%) were not improved compared with how they felt before the operation. There were no severe intra-operative complications. One patient developed a superficial wound infection



*Fig. 2.* — Intra-operative view : a) triceps split, b) fenestration of the olecranon fossa.

which responded to antibiotics, another patient developed a shoulder-hand syndrome. He was treated with anti-inflammatory physiotherapy and calcitonin injections with a poor result.

### DISCUSSION

The main advantage of the O-K procedure is that it allows access to both the anterior and posterior parts of the ulnohumeral joint without extensive soft tissue dissection. The procedure is safe, simple and the complication rate is low. Our complication rate did not differ from previous reports (1, 8, 10).

The disadvantage is that it does not allow access to the radiohumeral joint. Minami and Ishii (8)



**Fig. 3a.** — Severe osteoarthritis with multiple loose bodies, anteriorly and posteriorly ; severely deformed radial head.



**Fig. 3b.** — Postoperative aspect ; all loose bodies removed, radial head resection and good clinical outcome.

reviewed 111 elbows after O-K procedure with an average follow-up of 54 months. They reported that 39% had complete relief of pain, 21% had relief of pain with gain in motion and 61% had partial relief. Overall, 76% of patients had improved flexion and 55% had improved extension.

Morrey (10) has reported on 15 patients after 24 months follow-up. Fourteen of the 15 patients had good relief of pain. Elbow extension improved by 11°, and flexion by 10°. Objectively, 12 (80%) had good or excellent results and 13 (87%) believed that their condition was improved by the operation.

Antuña *et al* (1) has reported on 45 patients with primary osteoarthritis, with an average follow-up of 80 months. Thirty-five elbows (76%) had good relief of pain, the overall gain of motion was 22°, from 79° to 101°. Thirty-four elbows (74%) had good or excellent results. Our results are similar to these previous reports.

Tsuge and Misuzeki (17) used an extensive approach and debridement for advanced primary osteoarthritis of the elbow and their results showed a satisfactory gain of motion of 34° with good pain relief and improved grip, despite a 7% ectopic calcification rate.

Savoi and Nunley (14) described arthroscopic ulnohumeral debridement with fenestration of the olecranon fossa. In their series twenty of the twenty-four patients had an excellent result, two a good and two a fair rating. There was a good pain relief and the average arc of motion improved to 81°. The results indicate that arthroscopic fenestration of the olecranon fossa and debridement of the elbow is also an effective technique. It is nevertheless a demanding procedure and requires the skill of an experienced arthroscopist.

Cohen *et al* (2) compared the open O-K procedure and the arthroscopic modification. They found that both procedures were effective, with no major

Table III. — Range of elbow motion before and after O-K procedure

	Preoperative	Postoperative	
Flexion	120° (105° - 140°)	129° (115° - 145°)	
Extension loss	25° (5° - 47°)	15° (0° - 30°)	
Arc of motion	94° (65° - 120°)	114° (93° - 128°)	(p < 0,01)
MPI	63 (45 - 75)	88 (45 - 100)	(p < 0,01)

complications. The arthroscopic procedure achieved better results in relief of pain, whereas the open O-K procedure achieved better results in improving the range of flexion.

O'Driscoll (11) has recommended arthroscopy to treat milder case of osteoarthritis, reserving open debridement for more advanced cases. The arthroscopic procedure is limited to removing osteophytes from the tip of the olecranon process or from around the olecranon fossa, leading to a lesser improvement in the range of extension. Extension is also restricted by contraction of the anterior soft tissues and capsule (3) and possibly by joint surface remodelling. This study confirmed that the O-K procedure is an effective treatment for mild or moderate osteoarthritis of the elbow. The procedure gives a good relief of pain, significant improvement of the range of motion of the elbow and MPI. The results are satisfying and there is a low complication rate. Longer follow-up is however required.

#### REFERENCES

1. Antuña SA, Morrey F, O'Driscoll SW. Ulnohumeral arthroplasty for primary degenerative arthritis of the elbow. *J Bone Joint Surg* 2002 ; 84-A : 2168-2173.
2. Cohen A, Redden JF, Stanley D. Treatment of osteoarthritis of the elbow : a comparison of open and arthroscopic debridement. *J Arthroscopy* 2000 ; 16 : 701-706.
3. Kashiwagi D. Intra-articular changes of the osteoarthritis elbow, especially about the fossa olecrani. *J Jpn Orthop Assoc* 1978 ; 52 : 1367-1382.
4. Kashiwagi D. Osteoarthritis of the elbow joint. Intra-articular changes and the special operative procedure. Outerbridge-Kashiwagi method (O-K method). In : Kashiwagi D. (ed). *Elbow Joint*. Proceedings of the international congress, Japan. Amsterdam : Elsevier Science Publishers ; 1985 : pp. 177-188.
5. Kellgren JH, Lawrence JS. Radiologic assessment of osteoarthritis. *Ann Rheum Dis* 1957 ; 16 : 494-501.
6. McGinthy JB. Arthroscopic removal of loose bodies. *Orthop Clin North Am* 1982 ; 13 : 313-328.
7. Minami M. Roentgenological studies of osteoarthritis of the elbow joint. *J Jap Orthop Assoc* 1977 ; 51 : 1223-1236.
8. Minami NM, Ishii S. Outerbridge-Kashiwagi arthroplasty for osteoarthritis of the elbow joint. In : Kashiwagi D. (ed). *Elbow Joint*. Proceedings of the international congress, Japan. Amsterdam : Elsevier Science Publishers ; 1985 : pp. 189-196.
9. Morrey B, An K, Chao E. Functional evaluation of the elbow. In : Morrey B (ed). *The Elbow and its Disorders* (2<sup>nd</sup> ed), Philadelphia, Saunders 1993 : pp. 85-97.
10. Morrey BF. Primary degenerative arthritis of the elbow-treatment by ulnohumeral arthroplasty. *J Bone Joint Surg* 1992 ; 74-B : 409-413
11. O'Driscoll SW. Arthroscopic treatment for osteoarthritis of the elbow. *Orthop Clin North Am* 1995 ; 26 : 679-689.
12. O'Driscoll SW, Morrey BF. Arthroscopy of the elbow. *J Bone Joint Surg* 1992 ; 74-A : 84-94.
13. Oka Y. Debridement arthroplasty for osteosynthesis of the elbow. *Acta Orthop Scand* 2000 ; 71 : 185-190.
14. Savoie FH III, Nunley PD. Arthroscopic management of the arthritic elbow : Indications, technique and results. *J Shoulder Elbow Surg* 1999 ; 8 : 214-219.
15. Stanley D, Winson G. A surgical approach to the elbow. *J Bone Joint Surg* 1990 ; 72-B : 728-729.
16. Tajima T. Arthroplasty of the elbow joint with J-K membrane. In : *Elbow Joint*. Elsevier Science Publishers BV, Amsterdam 1985 : pp. 243-248.
17. Tsuge K, Mizuseki T. Debridement arthroplasty for advanced primary osteoarthritis of the elbow. Results of a new technique used for 29 elbows. *J Bone Joint Surg* 1994 ; 76-B : 641-646.